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JEFFERSON COUNTY REMEDIAL ACTION LANDS

1989 REMEDIATION STATUS
AND
ACTIONS FOR 1990

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EXECUTIVE SUMMARY

The fourth growing season of the remediation effort ended this past autumn. Weeds dominate the panorama of the remedial action lands. Approximately 90% of the plowed-reseeded lands have no seeded grass cover. The poor outcome of the reseeding effort appears very related to:

- 1) ineffective amounts and/or seasonal distribution of precipitation,
- 2) extremely rocky surfaces or clayey soils,
- 3) an expanding prairie dog population.

Most of the successfully seeded and established portions (10%) of the remedial action lands have produced a substantial stand of grasses. These areas also bear many weeds but should adequately suppress this weed onslaught.

Prairie dogs have devastated much of the vegetal cover of the remediation lands, including both the plowed, seeded strips and the alternating strips of unplowed prairie. Prairie dog control must occur in order to stabilize soils.

Planned actions include:

- 1) low and no tillage methods of reseeding,
- 2) irrigation for seedling establishment,
- 3) enduring weed suppression and control through mowing and herbicidal methods,
- 4) prairie dog suppression and control with physical and/or toxicogenic methods.

INTRODUCTION

This report concludes the fourth growing season since remedial activities were initiated on these lands; it summarizes both the 1989 land status and 1990 planned remedial actions.

The goal of the remediation effort is:

- 1) soil mixing to reduce surface concentrations of plutonium of the subject land to bring them into compliance with CDH guidelines of 2 d/m/g (.9 pCi/g) of dry soil, and
- 2) revegetation to stabilize the soils with a sustainable, reproducing vegetation (one that would evolve towards a native grassland).

No remedial activities occurred on these lands this past growing season due to a temporary void in the RFP position of the soils-range scientist. The position was filled in mid-September, after which the evaluation of land status was performed. During separate occasions, outside professional critiques were solicited from Gary Finstad of the USDA Soil Conservation Service, Wayne Woods of Vegetation Services and Frank Kunze of Jefferson County Open Space.

ECOLOGICAL AND MANAGERIAL STATUS OBSERVATIONS

During 1989, the remedial action lands existed in a state of weed infestation with a fair, but unreliable stabilization of soils. Figure 1 illustrates the managerial status of these lands.

Tall weeds such as Canadian, Russian and musk thistles as well as mustards dominate the plowed, reseeded lands. The substratum is dominated by shorter weeds such as bindweed and cheatgrass (downy brome). Weeds are the sole vegetal cover of approximately 90% of the reseeded lands.

Only 10% of the reseeded areas have a fair to excellent establishment of grasses. Despite a co-existing weed component in these areas, most of the grasses appear well enough established and to have the competitive advantage over the weeds for control of resources.

Localized surface accumulations of rocks (cobbles) occur over approximately 30% of the reseeded land. The majority of these cobbles surfaced during tillage and in some cases impose nearly a 90 percent surface coverage. These areas have a vegetal cover of weeds with no apparent seeded grasses.

A prairie dog infestation impacts approximately 60% and 30% of the northern and southern remediation lands, respectively. These percentages are inclusive of both the plowed, seeded lands and the unplowed lands (alternating strips of land that currently are planned to be plowed). Consequently, some of the unplowed lands exist in a stressed prairie/weed vegetation or pasture/weed vegetation.

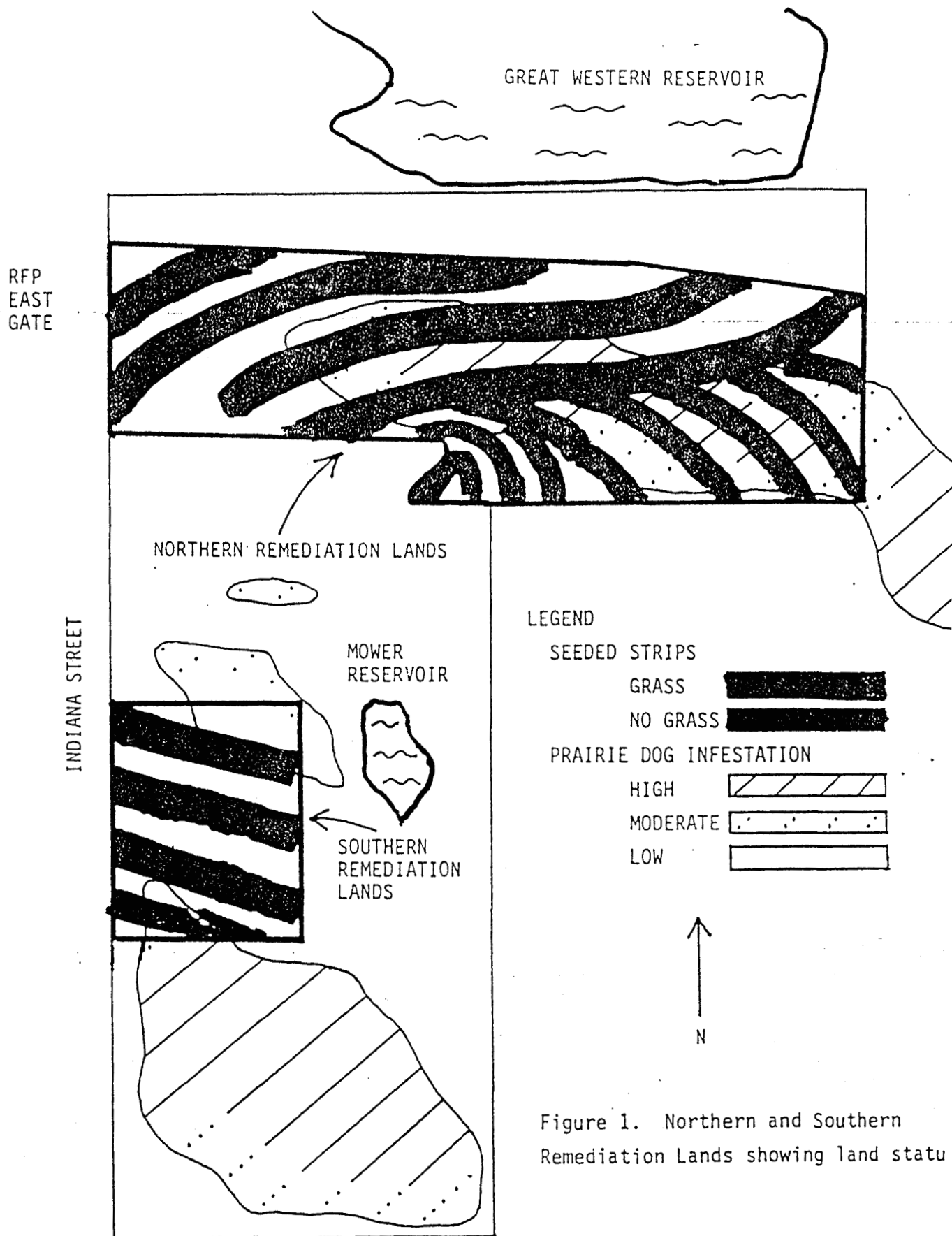


Figure 1. Northern and Southern Remediation Lands showing land statu

Where burrow density is greatest (about 20% of reseeded lands), the prairie dog impact to the landscape environment is of particular severity and interest. Here, with relatively minimal wind protection, are soil materials that once were purposely plowed under and now have been brought back to the surface around burrows, while between the burrows are vegetationally denuded soils. These barren soils are exposed to wind and water erosion.

SEEDING RESULTS ANALYSIS

Based on the above observations and precipitation records, the poor seeding and/or plant establishment results apparently can be attributed to at least three factors:

- 1) Lack of effective amounts of precipitation and soil moisture. Relative to the clayey and rocky soils, effective amounts of precipitation simply were not distributed over each year's growing season to coincide with timing of seed and/or seedling physiological demand. Winter and spring recharge of soil moisture apparently was inadequate some years for either germination or seedling requirements.
- 2) Extremely rocky surface. The rocks impeded placement and coverage of the fine seeds during the seeding operations.
- 3) Prairie dog infestation. The demise of any successfully emerged seedling is very predictable due to its palatability to the prairie dogs. In addition to their herbivory and burrowing habits, the rodent keeps a mowed vegetation as its visual defense against ground and aerial predators. Their activities promote soil destabilization. High activity areas surround individual burrows with barren soils (areas of 25ft² to 200ft² per burrow), while further out persistent and heavy grazing has eliminated grasses to favor a suppressed weed population.

The successfully seeded and established areas had little or no prairie dog activity. Otherwise, the 10% seeding success in the northern remediation lands appears very related to the factor of topography, which translates into the maintenance of favorable amounts of soil moisture. More specifically, the small areas of success occurred only on upland terrain that either was nearly level or sloping to the north (a NW to NE arc). These sites have a diminished evaporation rate of soil moisture relative to the hotter and drier south facing slopes.

Factors contributing to the 10% seeding success in the southern remediation lands were not apparent other than the possibility of pockets of deep and/or loamy soils.

1990 ACTIONS

In light of the above observations and analyses, management of the remedial action program will be intensified. The following action components will occur during 1990 in order establish and nurture a desired vegetation and stable soil.

A. Action Components

1) Change of seed mix: Through seeding evaluations and discussions with Gary Finstad and others, the following seed mix will be used for seeding operations during 1990. It is not substantially different from the original seed mix. As additional information is gleaned from results of remediation methods and procedures, it should be expected that subsequent requests for seed mix changes may be forthcoming.

<u>Species</u>	<u>Variety</u>	<u>Percent of Mix</u>	
		<u>old</u>	<u>new</u>
Western wheatgrass (Agropyron smithii)	arriba	40	40
Sideoats grama (Bouteloua curtipendula)	Vaughn	40	25
Blue grama (Bouteloua gracilis)		0	15
Pubescent wheatgrass (Agropyron trichophorum)	Luna	10	10
Smooth brome (Bromus inermis)	Lincoln	10	10

2) Prairie dog suppression and control: Approximately 100 acres are currently impacted by prairie dogs, perhaps 30 acres are critically impacted. Without controls or limits, prairie dog acreages tend to expand 20% to 30% per year. Thus, 80% of the northern remediation lands likely would be impacted by the end of the next growing season, 1990.

An effective control implies eliminating more than 80% of a prairie dog colony, otherwise the first annual reproduction is absorbed by the colony and brings the population back to 100%. (Normally when reproduction cannot be absorbed into the colony, pups will migrate to adjacent areas).

Live trapping and transplanting prairie dogs is discouraged by the Colorado Division of Wildlife. It is expensive and inefficient. More than half of transplanted prairie dogs die or are killed by predators during the first week unless expensive set-up efforts are performed. Late winter and early spring prior to pups being born is the best time for trapping.

A grain applied toxicant (zinc phosphide) is available and regulated by the EPA. However, it is only 85% to 90% effective and a return to 100% of the population can occur in just three years. The grain may impart a non-target kill, particularly birds. July 15 through November 15 are the effective use dates of this product.

An aluminum phosphide fumigation, regulated by the EPA, results in 95% to 98% reduction in prairie dogs. Since burrows are sealed, fleas which transmit bubonic plague become entrapped in holes. There is no residual poison on soils, vegetation or poisoned rodents (in fact, coyotes and foxes commonly dig out some of the carcasses and consume them). A non-target kill may occur in the burrows. April 1 through October 15 are the effective use dates of this product.

The most efficient approach to the arrest and control of the prairie dog infestation is fumigation. The procedure will be administered by a licensed pest control company. The prerequisite of a black-footed ferret reconnaissance or search will be complied with prior to the fumigation action.

3) Weed suppression and control: A program of herbicide spraying and mowing will be implemented this spring and summer to control the weed infestation and reduce any fire hazard such as might be created by downy brome (cheat grass). Applied herbicides will include only those approved by RFP, all of which have short term residuals.

4) Seed bed preparation: Tillage will not only provide a suitable seed bed in areas of least rockiness, but also may provide some control of certain weed species. Other than a possible herbicide treatment, the rocky areas will receive no pre-seeding treatment and seeding should occur with a hydroseeder. Any tillage of rocky areas may serve mostly to bring an even greater percentage of rocks to the surface while allowing fine soil materials to settle still further below the surface, thus, reducing both the effective area and already poor quality of seed bed.

5) Seeding: Two weeks subsequent to herbicide treatment of rocky areas, the seed mix will be hydroseeded (mid May at latest). On areas of least rockiness, a cover crop of forage sorghum will be drill seeded immediately following any tillage during late spring; then during late autumn interseeding of the seed mix will occur within the standing sorghum.

6) Mulching: Mulching will include a crimped or tackified straw mulch and a hydromulch, only the one most appropriate for site conditions to be used after each seeding operation.

7) Irrigation: The potentiality of another partial or season long dry spell must be reckoned with in order to have the greatest probability for success. The experiences of the past four seasons have shown moisture to be the most limiting factor of success. Subsequent to a successful seed germination, plant establishment can fail due to lack of effective soil moisture during critical periods. A single or dual truck spray irrigation system will be implemented this summer to meet the demands of

the seeded vegetation. The tanker truck will have a 4000 gallon capacity with a pump and top-mounted water gun. Source of supplemental water would be Pond C-2 or RFP domestic supply. With effective amounts of natural precipitation, supplemental watering would not be required.

B. ACTION IMPLEMENTATION CHRONOLOGY

1. SPRING 1990

PARTIES: Jefferson County Officials.
 ACTION 1: Respond to any proposed action, particularly regarding herbicide spraying, prairie dog suppression and seed mix changes.

PARTY: Remediation Coordinator.
 ACTION 2: Evaluate responses and accordingly arrange any contracts for herbicide spraying and prairie dog suppression and order seed mix.

Arrange contracts for tilling, seeding and mulching and leasing equipment.
 DATE Spring 1990

2. Spring 1990

PARTY: Contractors.
 ACTION 1: With appropriate consultations, apply herbicide to suppress cheatgrass and emerging broadleaf plants on lands to be reseeded. If necessary and similarly approved, apply broadleaf herbicide to the 10% successfully seeded and established areas in order to reduce any aggressive weed competition.

DATE DUE: Mid to late spring.

PARTY: Contractors.
 ACTION 2: Depending upon time since herbicide application, hydroseed the rocky areas with seed mix and cover with hydromulch. Till and seed forage sorghum on non-rocky areas. Mulch with straw and secure with tackifier or crimper.

DUE DATE: Late April through mid-June

PARTY: Remediation Coordinator or contractor
 ACTION 3: Irrigate when necessary for appropriate germination if natural precipitation fails to occur.

DATES DUE: April through mid-June

3. Summer 1990

PARTY: Remediation Coordinator.
ACTION 1: Closely monitor reseeded areas for necessary irrigation, weed control, fertilization and soil erosion. Accordingly, activate necessary contractor or personnel.
DATES DUE: Duration of summer.

4. Autumn 1990

PARTY: Remediation Coordinator.
ACTION 1: Closely monitor reseeded areas for necessary irrigation, weed control and soil erosion. Accordingly, activate necessary contractors or personnel.
DATE DUE: Early autumn.

PARTY: Contractor.
ACTION 2: Interseed forage sorghum areas with the seed mix and follow with mulch that is well secured and able to withstand the winds of winter and early spring.
DATE DUE: Early November.

5. 1991

PARTY: Remediation Coordinator.
ACTION: Monitor all aspects and status of remediation lands. Accordingly, respond and treat as described above or in another appropriate manner.
DATE DUE: Year round.

STATUS OF REMEDIAL ACTION PROGRAM ON
JEFFERSON COUNTY OPEN SPACE LAND
JANUARY 1989 TO AUGUST 1989

INTRODUCTION

This report summarizes the actions that have occurred on the remedial action lands east of Indiana Street adjacent to the Rocky Flats Plant. These lands are owned by Jefferson County. The last update presented to Jefferson County was in November of 1988.

SOUTH AREA ACTIVITIES - 20 ACRES
WEST OF MOWER RESERVOIR, SECTION 18

SPRING, 1987

Plowing and ripping operations were conducted on 20 acres in June and July. Four strips, 150 feet wide and 1500 feet long, were plowed. Sampling showed that the west end of the northern strip remained above the CDH standard. The northern strip was plowed a second time in July. This strip was sampled in September and results were below the CDH standard, so revegetation activities could proceed.

FALL, 1987

The plowed strips were disked in early November to kill the competitive weed species, primarily cheatgrass. To reduce or eliminate any wind or water erosion the surface was left in a roughened state, winter wheat was planted at approximately 20 pounds of seed per acre and a native grass hay mulch was crimped into the soil at a rate of 2 tons per acre. This work was completed in early December.

WINTER, 1987

Inspections of the area revealed that little if any erosion was occurring. The snow downwind of the area was clean, even after solar heating of the soil had exposed the mulched area.

SPRING, 1988

The native grass seed was planted in April through the existing cover of weeds without disturbing the surface to any great extent. A significant amount of natural vegetation that was not killed by the plowing was recovering and would increase the diversity of the revegetated surface.

FALL, 1988

The summer and fall months at the project site were extremely dry. A site visit with Mr. Gary Finstad of the U.S. Soil Conservation Service on October 17th, 1988 revealed that most of the seed is

lying dormant in the soil. Winter precipitation was expected to produce a good crop of native grass in the spring. Erosion protection consisted of the winter wheat that did germinate and a continuous cover of annual and perennial weeds.

SUMMER, 1989

A site visit with Mr. Gay Finstad of the U.S. Soil Conservation Service on July 24, 1989 revealed growth varying from good to poor. There is much musk thistle, bindweed and cheatgrass infestation. Recommendations were: 1) Leave areas with good grass establishment alone until next season, then control weeds and encourage vegetative reproduction by mowing. 2) Areas with marginal growth may show improvement in October due to cool season grasses. If growth is good, treat as no. 1 above, otherwise treat as no. 3 below. 3) Interseed into existing cover on or about November 1, 1989. Areas with cheatgrass infestation may be treated with herbicide (Roundup), but any herbicide effective on cheatgrass will also kill the desirable grasses. Bindweed can be eliminated with herbicide (Banvel). Timely mowing of musk thistle can be an effective control.

NORTH AREA - 100 ACRES

SOUTH OF GREAT WESTERN RESERVOIR, SECTION 7

SPRING, 1986

Approximately 100 acres were ripped and plowed in June and July. All areas that were plowed were sampled and meet the CDH standard.

FALL, 1986

Native grasses were seeded into the area.

SPRING, 1987

Inspections showed the vegetation had failed. Failure was attributed to the high rock content. In June, the 100 acres were ripped again and sterile sorghum was planted.

FALL, 1987

The sorghum cover was doing very well, even on the rocky areas. The plowed strips were sprayed with Roundup herbicide during the first two weeks in November. This successfully controlled competition from weeds, primarily cheatgrass. Erosion protection for the winter months consisted of the stalks of sorghum.

WINTER, 1987-1988

Inspections showed erosion was not a problem. Prairie dogs were noticed to be increasing in numbers. Prairie dogs can compromise revegetation efforts.

SPRING, 1988

Native grasses were seeded through the sorghum cover in April.

FALL, 1988

The summer was very dry and very little seed germinated over the summer. Winter precipitation was expected to produce more success in 1989. Erosion protection was provided by annual perennial weeds, rocks, and the remaining sorghum skeletons.

SUMMER, 1989

A site visit with Mr. Gary Finstad of the U.S. Soil Conservation Service on July 24, 1989 revealed that the southernmost strips showed good grass establishment. Some areas are very spotty and only marginally successful. The predominately rocky areas are showing few, if any, signs of grass and will need to be reseeded. Erosion control consists of native weed cover and rock. Recommendations were: 1) Leave areas with good grass establishment alone until next season, then control weeds and encourage vegetative reproduction by mowing. 2) Areas with marginal growth may show improvement in October due to cool season grasses. If growth is good, treat as no. 1 above, otherwise treat as no. 3 below. 3) Interseed into existing cover on or about November 1, 1989. Areas with cheatgrass infestation may be treated with herbicide (Roundup), but any herbicide effective on cheatgrass will also kill the desirable grasses. Bindweed can be eliminated with herbicide (Banvel).

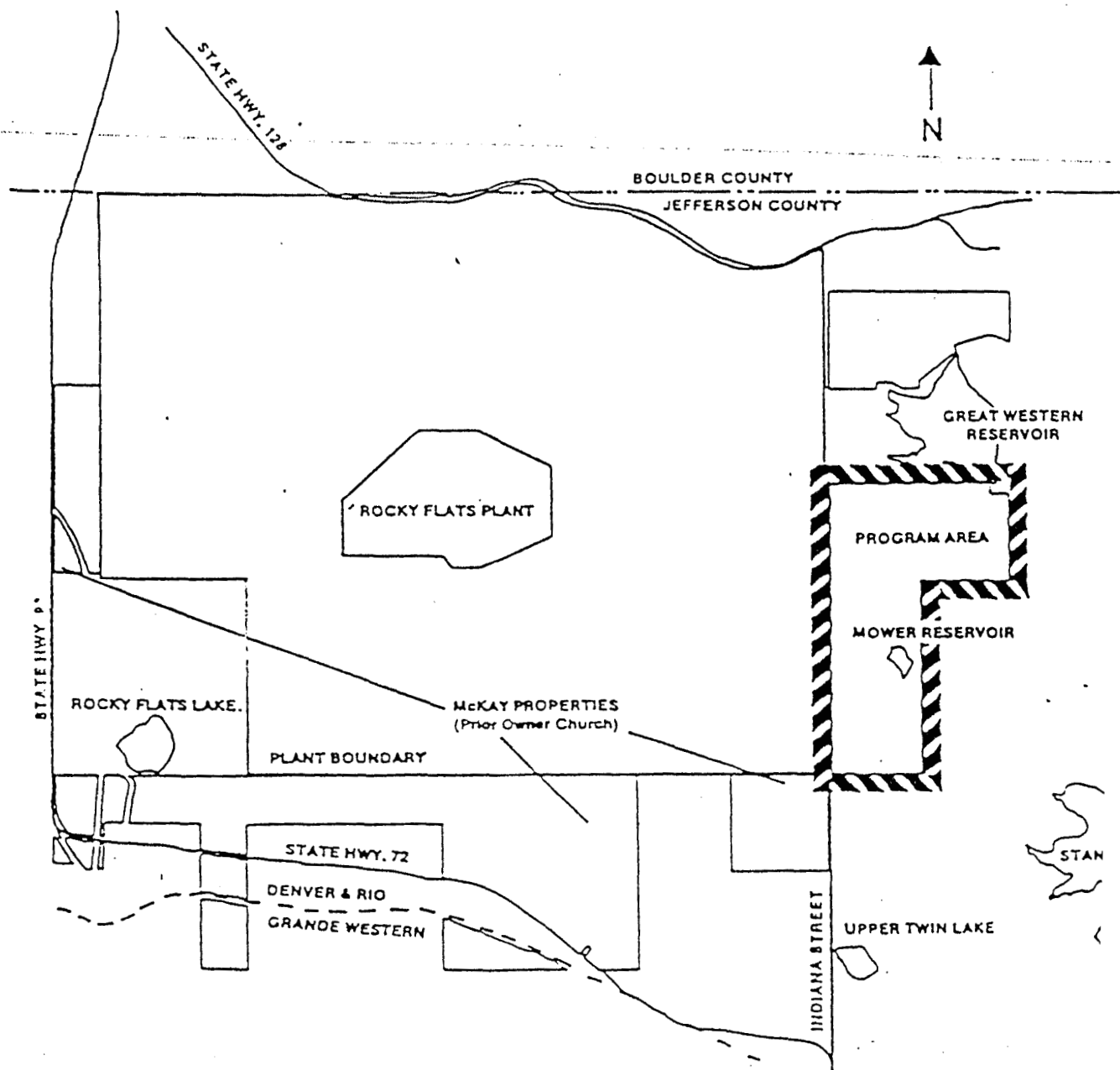


FIGURE 1. INDEX MAP SHOWING LOCATION OF PROGRAM AREA

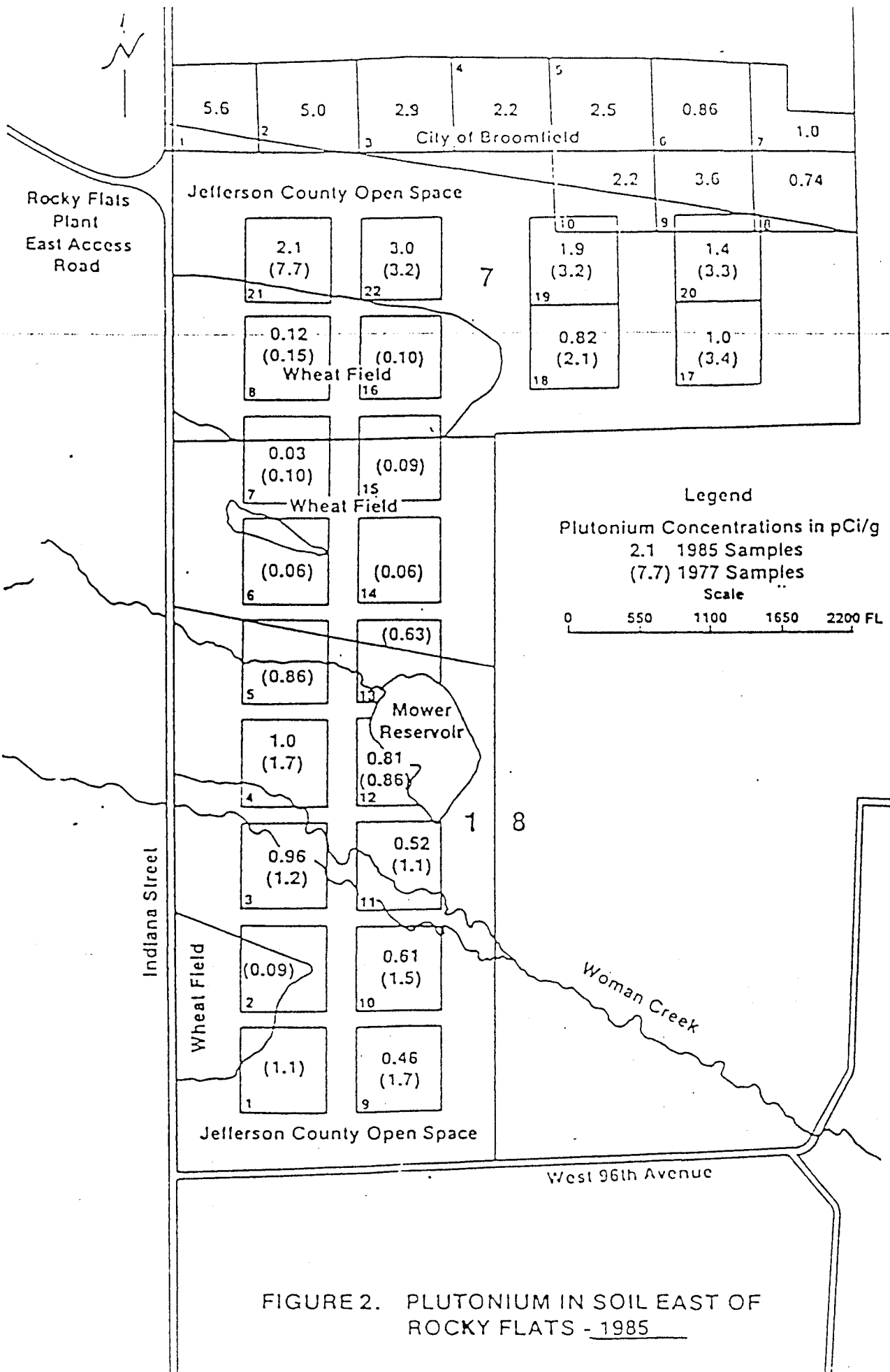
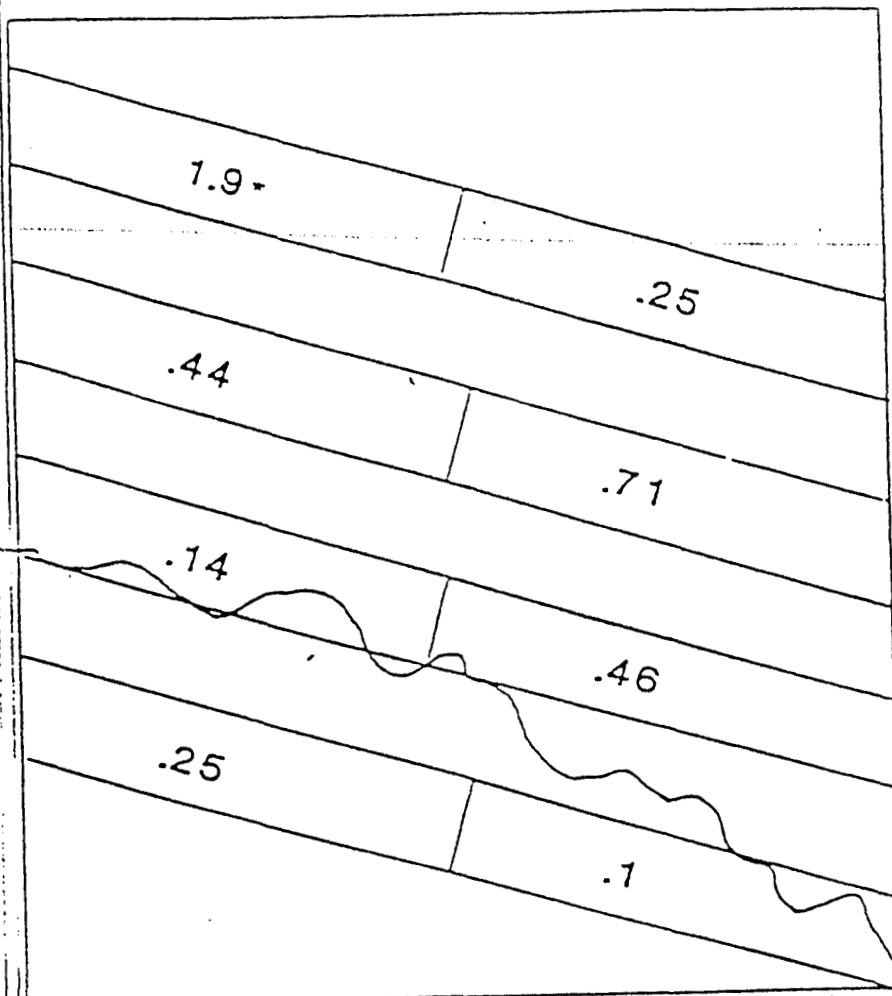


FIGURE 2. PLUTONIUM IN SOIL EAST OF ROCKY FLATS - 1985

INDIANA STREET



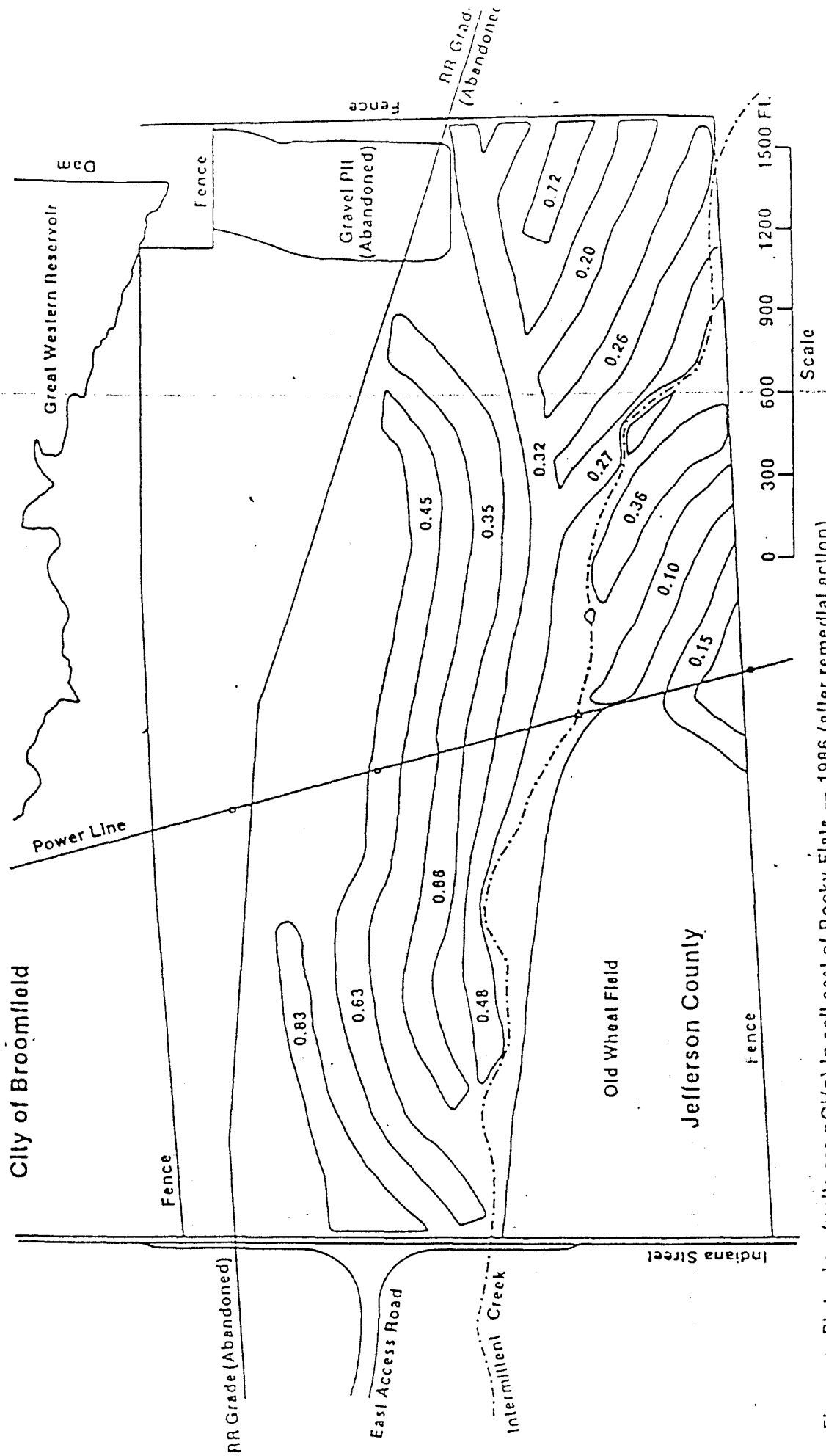
MOWE
RESERVE

WOMAN C.

FIGURE 3.
Plutonium in soil after 1987 plowing (units are pCi/g)

* This strip was plowed a second time. Duplicate analysis results after the second plowing were 0.04 and 0.13.

300 ft. 600 ft.



SEEDING RECOMMENDATION

<u>Species</u>	<u>Variety</u> ^{1/}	<u>Characteristics</u> ^{2/}	<u>Percent of mix</u>	<u>lb. per acre</u>
Western Wheatgrass (<u>Acrocyron smithii</u>)	Arriba	N,C,S	40	6
Sideoats Grama (<u>Bouteloua curtipendula</u>)	Vaughn	N,W,B	40	1
Pubescent Wheatgrass (<u>Acrocyron trichophorum</u>)	Luna	I,C,S	10	
Smooth Brome (<u>Bromus inermis</u>)	Lincoln	I,C,S	10	
TOTALS			100%	1

^{1/} These varieties were developed for conservation uses; they have superior vigor and production potential. They are available locally--ACCEPT NO SUBSTITUTES. We recommend that certified seed be purchased; this is a guarantee of species and varietal purity.

^{2/} Characteristics: N = native; I = introduced, not indigenous to this area; C = cool season (begins growth and makes seed in spring to early summer, with some regrowth in the fall); W = warm season (begins growth and makes seed in warm summer months); S = sod former; B = bunch grass.

^{3/} PLS = Pure Live Seed. This is viable seed of the right species. To find PLS in a bag or lot of seed, check the seed tag:

$$PLS = \frac{\% \text{ Purity} \times \% \text{ Germination}}{100}$$

If a bag of western wheatgrass has 90% purity and 80% germination, we have:

$$\frac{90 \times 80}{100} = 72\% \text{ PLS.}$$

If we want to seed 16 lb PLS/acre, and our PLS is 72%, we need to seed bulk seed at a rate of $\frac{16}{.72} = 22.2 \text{ lb/acre.}$